



AAR-100

Human Factors Newsletter # 02-20

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Project Report: *A Human Error Analysis of General Aviation Controlled Flight into Terrain (CFIT) Accidents Occurring Between 1990-1998* (Dr. Scott A. Shappell, CAMI and Dr. Douglas A. Wiegmann, Institute of Aviation, University of Illinois at Urbana-Champaign, IL)

Although all aviation accidents are of interest to the FAA, perhaps none are more disconcerting than those where a fully functioning aircraft is inexplicably flown into the ground. Referred to as controlled flight into terrain (CFIT), these accidents continue to be a major safety concern within aviation, in particular general aviation (GA). A previous study as part of the FAA's *Safer Skies* agenda examined 165 CFIT accidents using root cause analysis and developed 55 interventions to address their causes. While the study represented the work and opinions of several experts in the FAA and industry, the findings might have benefited from a more detailed human error analysis involving a larger number of accidents. In this study, five pilot-raters independently analyzed over 16,500 GA accidents occurring between 1990-1998 using the Human Factors Analysis and Classification System (HFACS). Of the GA accidents examined, 1407 were identified as CFIT and were compared with non-CFIT accidents using HFACS. The analysis revealed a number of differences in the pattern of human error associated with CFIT accidents. Findings from this study support many of the interventions identified by the CFIT Joint Safety Analysis Team (JSAT) and Joint Safety Implementation Team (JSIT), and will permit safety professionals to better develop, refine, and track the effectiveness of selected intervention strategies. (W. Krebs, AAR-100) <mailto:william.krebs@faa.gov>

Award: The Flight Safety Foundation's Admiral Luis de Florez Flight Safety Award was presented to Dr. Scott Shappell of the Civil Aerospace Medical Institute and Dr. Douglas Wiegmann of the University of Illinois at Urbana-Champaign on November 6th in Dublin, Ireland. The award recognized their efforts to develop and apply the Human Factors Analysis and Classification System (HFACS) as a reliable taxonomy for investigating human factors data in aviation accidents and incidents. Recognizing an opportunity to introduce systematic methods of classifying human factors in accident investigation, Dr. Shappell and Dr. Wiegmann applied Dr. James Reason's model of active and latent failures in complex systems to describe four levels of failures/conditions: unsafe acts, preconditions for unsafe acts, unsafe supervision, and organizational influences. HFACS also provides objective subcategories for detailed analysis, such as subdividing unsafe acts into errors and violations and subdividing errors into skill-based errors, decision-related errors, and perceptual errors. Developed originally for the U.S. Navy and

the U.S. Marine Corps and tested by the U.S. Naval Safety Center, HFACS enabled military investigators to identify operational areas that required safety interventions and to assess the effectiveness of interventions. HFACS later was adopted by international military and civil aviation organizations to investigate and/or analyze data from hundreds of aviation accidents. Investigators around the world have used this tool to look beyond the actions of individuals and consider critical preconditions such as the role of supervisors and the role of organizations in the error process. As a result, safety risks in diverse activities such as flight operations, air traffic control and aircraft maintenance are now being addressed with HFACS. (D. Schroeder, CAMI).

Fatigue Management

- Dr. Thomas Nesthus (AAM-510) participated in the Department of Transportation's Operator Fatigue Management (DOT OFM) Reference Handbook workgroup meeting, October 22-23, 2002. Representatives from the DOT modes were joined by industry partners, including four representatives from Air, seven from Rail, five from Shipping, and six from Trucking. The DOT OFM program is pulling together the expertise of government and industry to create tools that respond to the immediate needs of operators who must cope daily with unusual and difficult work schedules and the practicalities of fatigue management. As part of this program, the *Fatigue Management Reference Handbook* is being developed to provide practical information that can be used to reduce fatigue among commercial transportation workers. The objective of the workgroup meeting was to obtain guidance from representatives of the commercial transportation industry regarding the topical emphasis, general style, and basic format of this first-generation commercial transportation fatigue management handbook. (D. Shroeder, CAMI)
- Dr. Thomas Nesthus (AAM-510) participated in the DoD Human Factors Engineering Technical Advisory Group (DoD HFE TAG) meeting November 4-7, 2002. He served as Chair of the Sustained and Continuous Operations (SUSOPS) SubTAG. The SUSOPS speakers provided attendees with important information concerning the issue of fatigue and operational impairment. The program included:
 - (1) An eye-witness report concerning the effects of fatigue from *Flight Crew Resource Management: Aircrew Fatigue and the DC-8 Accident at Guantanamo Bay, Cuba*, 1993 by Thomas R. Curran FAA/ATL-FSDO-11, College Park, GA.
 - (2) *Techniques and Issues Associated with Investigating Fatigue in Aviation Accidents* by Malcolm Brenner, Evan Byrne, William Bramble, Human Performance, Office of Aviation, National Transportation Safety Board
 - (3) *Performance Modeling as a Tool for Effective Fatigue Management and Schedule Evaluation* by Steven R. Hursh, Program Area Manager, Biomedical Modeling and Analysis Program, Science Applications International Corporation
 - (4) *Toward a Comprehensive Sleep Management System: An Overview of CONOPS Research at WRAIR* by Thomas Balkin, Nancy Wessensten, Daniel Redmond, David

Thorne, Maria Thomas, Helen Sing, Gary Kamimori, William Killgore, Gregory Belenky, Department of Behavioral Biology, Walter Reed Army Institute of Research

(5) *The Walter Reed Palm-held Psychomotor Vigilance Test* by David Thorne and Daniel Redmond, Walter Reed Army Institute of Research

Electronic Flight Bag (EFB)

- Dr. Divya Chandra of the Volpe Center was an invited speaker at an industry panel on EFBs hosted by Jeppesen, Inc. in Beaver Creek, Colorado on October 16th. She presented a paper on EFB human factors considerations to the group. Over 100 attendees were at the meeting, primarily high-level airline executives from domestic and international carriers. Jeppesen is a global supplier of aviation and navigation products, such as aeronautical charts. They recently announced a partnership with Boeing Company and Astronautics to sell their Electronic Flight Bag™ that would include software applications written by Jeppesen to support electronic aeronautical charts and a surface moving map display. (T. McCloy, AAR-100)
- On October 24th, Dr. Chandra presented a paper on her EFB research at the International Conference on Human-Computer Interaction in Aeronautics. Her talk was focused on the human-factors evaluation process for EFBs. First, she reviewed her document on human factors considerations for EFBs, then she discussed on-going work to develop a methodology for performing regulatory human-factors evaluations of EFBs. An updated draft of the EFB human factors document was recently released to industry for comment (September 2002). (T. McCloy, AAR-100)

NAS Architecture Blueprint Released: The FAA Office of System Architecture and Investment Analysis released the 2002 Update of the Blueprint for NAS Modernization last week. <http://www1.faa.gov/nasarchitecture/Blueprint2002.htm> . This is a really good, relatively short, easy-to-read overview of the NAS architecture and our modernization efforts. It is a "must read" for all ARA employees. (P. Gervasi, ARA-3)

R&D Strategy: Now is a time to become familiar with the recently-published FAA R&D Strategy, which can be found on the AAR website at <http://research.faa.gov/aar/rdstrat.asp>. Like the Blueprint (above), this is a very readable overview of FAA's research challenges and strategies, put in the context of the FAA's safety, efficiency, and environmental goals. (P. Gervasi, ARA-3)

Synthetic Vision: A CAMI scientist traveled to the NASA Langley Research Center in Hampton, Virginia to attend a Synthetic Vision Systems (SVS) Workshop. The purpose of the workshop was to review recent NASA research on synthetic vision system aircraft displays, review current cockpit displays that incorporate SVS technology, and to discuss useful areas of future research. A set of displays from Chelton Flight Systems will be used in the second phase of the Alaska Capstone Program in southeast Alaska. (K. Williams, CAMI)

HCI Aero 2002 Conference: The 2002 International Conference on Human-Computer Interaction in Aeronautics was recently held at the Volpe Center in Cambridge, MA (October 23-

25, 2002). The conference was organized by the European Institute of Cognitive Sciences and Engineering (Eurisco), and co-hosted by the Volpe Center and MIT. Approximately 100 international human factors professionals from academia, government, and industry attended. (D. Chandra, VNTSC; T. McCloy, AAR-100) <http://www-eurisco.onecert.fr/events/hci-aero2002.html>

Report on Future of Aerospace Issued: The report by the U.S. Commission on the Future of Aerospace is now available. It contains a set of nine recommendations for government and industry action. According to *Federal Computer Week*, the commission gives the FAA's Operational Evolution Plan, "its stamp of approval." (G. Lavey, APA-100) <http://www.aerospacecommission.gov/>

More information on human factors research can be found at the FAA Human Factors (AAR-100) web site: <http://www.hf.faa.gov>

Mark D. Rodgers
FAA (AAR-100)



December 2-5, 2002: Inter-Service/Industry Training, Simulation and Education Conference (I/ITSEC), Orlando, FL <http://www.iitsec.org>

December 10-14, 2002 – Neural Information Processing Systems 2002, Vancouver, Canada <http://www.nips.cc/>

December 11, 2002 – ARA ISS Summit, Holiday Inn Capitol, Wash, DC
<mailto:bette.jo.madden@saic.com>

January 6-9, 2003 - 41st AIAA Aerospace Sciences Meeting and Exhibit at the Reno Hilton, Reno, Nevada. For more information, visit [Event Website](#)

January 12-16, 2003 – Transportation Research Board 82nd Annual Meeting in Washington, DC
<http://www4.trb.org/trb/annual.nsf>

January 13-17, 2003 – SAE S-18 Airplane Safety Assessment Committee, Salt Lake City, UT
<mailto:lemon@sae.org>

January 14-16, 2003 – SAE Aircraft Seat Committee, San Diego, CA <mailto:elizd@sae.org>

January 16-17, 2003 – National Research Council, Committee on Human Factors, The National Academies, Wash, DC http://www7.nationalacademies.org/bcsse/BCSSE_Meetings.html

January 27-30, 2003: Annual Reliability and Maintainability Symposium (RAMS), Tampa, FL
<http://www.rams.org/>

January 27-31, 2003 – SAE G-10 Aerospace Behavioral Engineering Technology Committee, Melbourne, FL <mailto:lemon@sae.org>

February 4-6, 2003 – SAE North American Aviation Safety Conference, Atlanta, GA
<http://www.sae.org/calendar/aeromtg.htm>

February 9 – 11, 2003 - Heli-Expo 2003, Dallas, Texas. Contact: www.rotor.com

February 11 – 16, 2003 - Australian International Air Show, Melbourne, Australia. Contact: www.pacific2002.net.au

February 25-26, 2003 – FAA Research, Engineering and Development Advisory Committee, Subcommittee on Human Factors Meeting, FAA Headquarters, Room 932
<mailto:gloria.dunderman@faa.gov>

March 3-6, 2003 – SAE 2003 World Congress, Cobo Center, Detroit, MI
<http://www.sae.org/congress/index.htm>

March 18-19, 2003 - 28th FAA Commercial Aviation Forecast Conference at the Renaissance Washington DC Hotel, Washington, DC. For more information, visit [Event Website](#)

March 17-19, 2003 – 15th Annual European Aviation Safety Seminar presented by the Flight Safety Foundation and European Regions Airlines Association, Hotel Intercontinental Geneva, Geneva, Switzerland <http://www.flightsafety.org/seminars.html>

March 24-28, 2003 – SAE Airplane Safety Assessment Committee, Lisbon, Portugal
<mailto:lemon@sae.org>

April 2-8, 2003 – Sun ‘n Fun EAA Fly In, Lakeland, FL <http://www.sun-n-fun.org>

April 5-10, 2003 – CHI 2003 Conference on Human Factors in Computing Systems, Broward Convention Center, Ft. Lauderdale, FL <http://www.chi2003.org/>

April 7-27, 2003 – Aviation World’s Fair, Newport News/Williamsburg, VA
<http://www.worlds-fair.com/> or <http://aviation-worlds-fair.com/>

April 9-11, 2003 – SAE Aircraft Environmental Systems Committee, Dayton, OH
<mailto:elizd@sae.org>

April 22-23, 2003 – 48th Annual Corporate Aviation Safety Seminar, presented by the Flight Safety Foundation and the National Business Aviation Association, Westin Diplomat Resort and Spa, Hollywood, FL <http://www.flightsafety.org/seminars.html>

April 27-30, 2003 – Symposium on Interactive 3D Graphics, Monterey Marriott, Monterey, CA
<mailto:Pausch@cmu.edu>

May 3-10, 2003 – International Conference on Software Engineering, Hilton Portland, Portland, OR
<mailto:ldillon@cse.msu.edu>

May 4-9, 2003 – 74th Annual Scientific Meeting of the Aerospace Medical Association, Convention Center, San Antonio, TX <http://www.asma.org/>

May 6 – 8, 2003 - AHS International 59th Annual Forum and Technology Display, Phoenix Civic Plaza, Phoenix, AZ. [General Information](#) - [Call for Papers](#) - [Exhibitors](#)

May 12-17, 2003 - 2003 IEEE International Conference on Robotics and Automation, The Grand Hotel, Taipei, Taiwan <http://www.icra2003.org/>

June, 2003 – SAE Digital Human Modeling for Design and Engineering, Location TDB
<http://www.sae.org/calendar/aeromtgs.htm>

June 15-22, 2003 – 45th Paris Air Show le bourget <http://www.paris-air-show.com/index3.htm>

June 22-27, 2003 – 10th International Conference on Human-Computer Interaction, Institute of Computer Science Foundation, Research and Technology, Science and Technology Park of Crete, Heraklion, Crete, Greece <mailto:info@hcie2003.gr>

June 24-26, 2003 – Human Systems Integration Symposium “Enhancing Human Performance in Naval and Joint Environments”, Sheraton Premier Hotel, Tyson’s Corner, VA
<http://www.navalengineers.org/>

July 7-10, 2003 – SAE 33rd International Conference on Environmental Systems, The Westin Bayshore Resort and Marina, Vancouver, Canada <http://www.sae.org/calendar/aeromtgs.htm>

July 14-17, 2003 – AIAA/ICAS International Air & Space Symposium and Exposition, Dayton Convention Center, Dayton, OH <http://www.flight100.org/>

July 21 – 23, 2003 - 4th Australian Pacific Vertiflite Conference on Helicopter Technology, Melbourne, Victoria, Australia. Contacts: [Dr. Arvind K. Sinha](#) and [Mr. Raden Kusumo](#)

July 29-August 4, 2003 – 51st Annual AirVenture, Oshkosh, WI <http://airventure.org/>

August 7-10, 2003 – 111th Convention of the American Psychological Association, Toronto, Ontario, Canada <http://www.apa.org/convention>

September 16 – 18, 2003 - 29th European Rotorcraft Forum, Friedrichshafen, Germany. Contact B. Gmelin at bernd.gmelin@dir.de

September 9-11, 2003 – SAE Aerospace Congress and Exhibition, Palais des Congrès, Montreal, Quebec, Canada <http://www.sae.org/calendar/aeromtgs.htm>

October 6 – 9, 2003 - NATO Research and Technology Agency, Applied Vehicle Technology Panel (AVT) will present "The Vehicle Propulsion Integration Symposium" in Poland. For more information contact cheynes@rta.nato.int

October 7 – 9, 2003 - National Business Aviation Association Annual Meeting & Convention, Orlando, Florida. Contact: www.nbaa.org

October 13-17, 2003 – Human Factors and Ergonomics Society 47th Annual Meeting, Adams Mark Denver Hotel, Denver, CO <http://www.hfes.org/>

*January 11-15, 2004 – Transportation Research Board Annual Meeting, Washington, DC
<http://www4.trb.org/trb/annual.nsf>*

January 21 – 23, 2004 - AHS 4th Decennial Specialists' Meeting on Aeromechanics, Fisherman's Wharf, San Francisco, CA. For more information contact the Technical Chairman, Tom Maier at tmaier@mail.acr.nasa.gov

April, 2004 – SAE General Aviation Technology Conference and Exhibition, Century II Convention Center, Wichita, KS <http://www/sae.org/calendar/aeromtgs.htm>

May 6-8, 2004 - AHS International 60th Annual Forum and Technology Display, Virginia Beach, VA. Contact Staff@vtol.org

July 27-August 2, 2004 – 52nd Annual AirVenture, Oshkosh, WI <http://airventure.org/>

May 2-7, 2004 – 75th Annual Scientific Meeting of the Aerospace Medical Association, Egan Convention Center, Anchorage, AK <http://www.asma.org/>

July 28 – August 1, 2004 – 112th Convention of the American Psychological Association. Honolulu, Hawaii <http://www.apa.org/convention>

September 20-24, 2004 – Human Factors and Ergonomics Society 48th Annual Meeting, Sheraton New Orleans Hotel, New Orleans, LA <http://www.hfes.org/>

Note: Calendar events in Italics are new since the last Newsletter



Comments or questions regarding this newsletter?

Please contact Bill Berger at (334) 271-2928

or via e-mail at bill.ctr.berger@faa.gov

